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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/068,273	02/07/2002	Aravind Padmanabhan	H19 02237 US	4265

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EXAMINER

VO, HAI

ART UNIT	PAPER NUMBER
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1771

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DATE MAILED: 03/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/068,273		PADMANABHAN ET AL.	
	Examiner		Art Unit	
	Hai Vo		1771	

-- Th **MAILING DATE** of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
- 4a) Of the above claim(s) 18-44 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 45-49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 February 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>4</u> . | 6) <input type="checkbox"/> Other: _____ |

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-17, and 45-49, drawn to a photonic crystal, classified in class 428, subclass 304.4+.

II. Claims 18-44, drawn to a process of making a photonic crystal, classified in class 216, subclass 56.

The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by another and materially different process such as one that forming an array of microscopic spheres on a smooth substrate into a diamond lattice instead of a faced center lattice.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

2. During a telephone conversation with Richard S. Roberts on 02/19/2003 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-17, 45-49. Affirmation of this election must be made by applicant in

replying to this Office action. Claims 18-44 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

4. Claims 1-12, 15 and 16 are rejected under 35 U.S.C. 102(a) as being anticipated by Zakhidov et al (US 6,261,469). Zakhidov discloses a photonic crystal comprising a three-dimensionally periodic microporous structural matrix of interconnecting, crystallographically oriented, monodispersed members having voids between adjacent members, and members having randomly nanoporous surface porosity (figure 9). The photonic crystal composed of 250 nm SiO₂ spheres (column 28, lines 51-52). With regard to claim 4, Zakhidov discloses the members comprise surfaces or interfaces that are inverse replicas of the surface of a monodispersed sphere array, wherein necks exits between neighboring spheres in the sphere array and the average sphere diameter is from 20 nm to 100 nm (column 4, lines 20-25). With

regard to claim 5, Zakhidov discloses the nanoporous surface porosity comprising nanopores having an average pore diameter of from 0.4 to 1 nm (column 4, lines 55-57). With regard to claims 6-10, Zakhidov reads on the claim limitations (column 25, lines 18-27, and column 27, lines 65 et seq.) With regard to claims 11 and 12, Zakhidov teaches the photonic crystal disposed on a surface of a silicon substrate (column 23, lines 21-24, column 25, line 20). With regard to claims 15, 16, Zakhidov discloses the article useful as a piezoelectric sensor (abstract). It is the examiner's position that Zakhidov anticipates the claimed subject matter.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zakhidov et al (US 6,261,469) as applied to claim 1, in view of Russell et al (US 6,093,941). Zakhidov discloses the photonic crystal deposited on a diamond substrate (column 23, lines 27-30). Russell teaches a photonic band gap material can be deposited on a sapphire substrate (column 4, lines 25-28, figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ a sapphire substrate on which the photonic crystal is deposited motivated by the desire to obtain excellent transparency, flatness and chemical resistance (Russell, column 7, lines 23-25). Since Zakhidov as modified by Russell

is using the same sapphire material to form a substrate for the photonic crystal, it is the examiner's position that the properties of the substrate set out in the claim would be inherently present.

7. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zakhidov et al (US 6,261,469) as applied to claim 1, in view of Koops (US 6,064,506). Zakhidov is silent as to a liquid crystal imbibed on the photonic crystal. Koops teaches the cavities of photonic crystals filled with the liquid crystals (column 1, lines 53-55). It would have been obvious to one having ordinary skill in the art at the time the invention was made to fill the cavities of the photonic crystal with liquid crystal material motivated by the desire to tailor the optical behavior of the photonic crystal to meet the desired needs.
8. Claims 45, 46, 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zakhidov et al (US 6,261,469) in view of Jewell (US 5,617,445). Zakhidov discloses a photonic crystal comprising a three-dimensionally periodic microporous structural matrix of interconnecting, crystallographically oriented, monodispersed members having voids between adjacent members, and members having randomly nanoporous surface porosity (figure 9). The photonic crystal composed of 250 nm SiO₂ spheres (column 28, lines 51-52). Zakhidov discloses the nanoporous surface porosity comprising nanopores having an average pore diameter of from 0.4 to 1 nm (column 4, lines 55-57). Zakhidov is silent as to a metal layer deposited on opposite surfaces of the photonic crystal. Jewell teaches the photonic crystal comprising the top and bottom contacts 44, 46 made of silver or gold (column 6, lines 19-23). It

would have been obvious to one having ordinary skill in the art at the time the invention was made to deposit two metal layers on the opposite surfaces of the photonic crystal motivated by the desire to optimize the light transmitting through the photonic crystal.

With regard to claim 46, It is the examiner's position that the article of Zakhidov as modified by Jewell is only slightly different than the claimed article prepared by the method of the claim, because both articles are made of the same materials, having structural similarity (metal layer/photonic crystal/metal layer). Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or an obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to the applicant to show unobvious differences between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289,291 (Fed. Cir. 1983). The Zakhidov/Jewell references strongly suggested the claimed subject matter. It is noted that if the applicant intends to rely on Examples in the specification or in a submitted Declaration to show non-obviousness, the applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with Zakhidov/Jewell.

With regard to claim 48, Jewell teaches the photonic crystal comprising a light emitter 14,16,18,20, and 22 positioned to direct light onto the photonic crystal (figure 1A). It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the light emitter motivated by the desire to enhance the efficiency of the light emission.

With regard to claim 49, the combination of Zakhidov and Jewell fails to teach the wavelength at which the article is operated. However, since the article of Zakhidov as modified Jewell meets all the limitations as set forth in the claims, it is the examiner's position that the article would inherently perform the same function as that of the present invention. It seems from the claim, if one meets the structure recited, the properties must be met or Applicant's claim is incomplete (Note discussion found in Ex parte Slob, 157 USPQ 172).

9. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zakhidov et al (US 6,261,469) and Jewell (US 5,617,445) as applied to claim 45 above, further in view of Koyama et al (US 6,462,356). The combination of Zakhidov and Jewell fails to disclose an electrode attached to the electrically conductive and optically transparent layer. Koyama teaches a light emitting device comprising a pair of electrodes attached to the light emitting layers (column 1, lines 35-40). It would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the pair of electrodes motivated by the desire to apply an electric field to the light-emitting layer.

Art Unit: 1771

10. Claims 1-3, and 6 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ichimura et al (US 6,456,416). Ichimura teaches a photonic crystal comprising a three-dimensionally periodic porous structural matrix of interconnecting, crystallographically oriented, monodispersed members having voids between adjacent members, and members having randomly nanoporous surface porosity (figure 1). The porous silica has an average void diameter of 30 nm (column 19, line 47). Ichimura is silent as to the microporous structural matrix of interconnecting of SiO₂ spheres. Since the porous silica of Ichimura has the same diamond or cubic lattice as the photonic crystal of the present invention, it is the examiner's position that the microporous structural matrix of interconnecting of SiO₂ spheres would be inherently present. Note In re Best 195 USPQ at 433, footnote 4 (CCPA 1977) as to the providing of this rejection under 35 USC 103 in addition to the rejection made under 35 USC 102. It is the examiner's position that Ichimura anticipates or strongly suggests the claimed subject matter.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai Vo whose telephone number is (703) 605-4426. The examiner can normally be reached on Tue-Fri, 8:30-6:00 and on alternating Mondays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on (703) 308-2414. The fax phone

Art Unit: 1771

numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

HV
February 25, 2003

A handwritten signature in black ink, appearing to read "Terrel Morris", with a stylized flourish extending from the end.

TERREL MORRIS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700